Technology: Competitive & Complementary

RFID to overtake IR and UV in casinos

Counterfeit chips have long been a problem for casinos, and houses routinely mark chips with inks visible only in IR or UV light. Now RFID tags, which simply modify the radio signal fired at them by the reader working over distances ranging from a few centimetres to a few dozen metres. Embedded RFID tags should make the chips much harder to counterfeit, and placing tag readers at staff exits could cut down on theft by employees. Tags could also help casinos manage large-scale theft, allowing casinos to identify stolen chips without the expensive process of restocking.

Immersion litho

R&D consortium International Sematech's final workshop on immersion technology has the three major litho tool vendors with immersion tool roadmaps, and production tools slated for 2006. Additional engineering work remains, but the technology should be ready for production at the 65nm node.

Japanese supplier Nikon Corp is shipping an engineering evaluation tool in Q3 of this year, with a full-field tool with a numerical apertureof 0.85. It plans to have a production-worthy tool with an NA of 0.92 by 2005, and a tool with an NA of 1 by 2006. Canon says that it began building two engineering evaluation systems last year, aiming at 2006 for production-ready 193nm immersion tools. Immersion technology with 193nm lithography has a cost of ownership plus over 157nm. Dutch ASML is shipping its immersion tool to Taiwan Semiconductor Manufacturing Co in Q3 this year. The 1250i is to be to followed by production-ready tools.

Ambient energy harvesting for wireless applications

Interest in ambient energy is being shown in European research at IMEC and in the Scottish Universities Speckled Computing project. Now US MicroStrain engineers are investigating mechanical strain in piezoelectric material as a source of energy and have won a US navy $700,000 R&D grant for a two year programme covering a new class of wireless sensor relying on harverstting strain and vibration energies from their working environment to send sensed information wirelessly to a central point.

This scenario would not only reduce the cost of sensor applications by reducing costly wiring and replacement of batteries, but it will also expand the types of applications where sensors can be deployed Phase I of the program will realise improvements in efficiency of the piezoelectric energy harvesting circuit, and development of mathematical models to facilitate piezoelectric energy harvesting from a straining structure and vibratory environment. Phase II will focus on ship board network communications.

MicroStrain hopes to have a feasible commercial system within 18 months, where strain energy will be stored by rectifying piezoelectric fibre output into a capacitor bank. When capacitor voltage reaches a preset threshold, power transfers to an integrated wireless sensor.

Nanoscale ferroelectrics

A group of University of Arkansas physicists led by Huaxiang Fu, assistant professor of physics, and Laurent Bellaiche, associate professor of physics has determined that ferroelectric materials, that allow energy conversions, retain their properties at the nanoscale.

Using computer modeling, Fu and Bellaiche looked at barium titanium oxide ($BaTiO_3$), a typical ferroelectric material. While they found that BaTiO3 quantum dots would continue to have a dipole at the nanoscale, some differences do exist between the nanoscale material and its bulk counterpart.

For instance, the researchers found that converting electricity to mechanical energy, for the specific case studied, is less efficient at the nanoscale than at the classical scale. They also found that, unlike in $BaTiO_3$ bulk, dipoles do not naturally align in the same direction in the nanomaterial, but rather form a vortex pattern. They discovered that the dipoles do align if the researchers use a voltage that is strong enough. The voltage required to make the dipoles line up depends upon the length of the material.

These findings mark the first look at the properties of ferroelectric compounds at the nanoscale and will allow researchers to begin to further explore these properties.

"This is a new field. No one really knows the answers," says Fu.

eMagin obtains US patent for OLED device

eMagin Corporation developer of active matrix organic light emitting diode (OLED) microdisplays, has raised approximately $4.2m with options to acquire an additional two tranches of $2m each no later than in 6 months and 12 months. Provided the optional two tranches are invested over the next year, eMagin will have issued approximately 5.6m shares and received gross proceeds of approximately $8.4m.

This follows on the company being granted a US patent no:6,657,224 for an *Organic Light Emitting Diode Devices Using Thermostable Hole-Injection and Hole-Transport Compounds*. Hole transport layers have historically been the weakest link in temperature stability, forward voltage, and power efficiency of single molecule-based OLEDs.

The invention describes a new thermally stable class of hole transport compounds integrated into multi-layered organic LEDs. The materials are prepared as nanostructure layers approximately 10-50nm thick as part of a multi-layered OLED device allowing for a more gradual change in the energy of holes and electrons, resulting in a lower operating voltage and a high quantum yield of luminescence for each current level.

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